DAVID P. POPE, PH.D.
624 ST. ANDREW ROAD
PHILADELPHIA, PA 19118

PHONE: 215-247-7234
FAX: 215-247-7554

11/26/06

John T. Donovan
Rawle & Henderson
The Widener Building
One South Penn Square
Philadelphia, PA 19107

RE: Revak v. Locatum, et al

Dear Mr. Donovan,

I am writing to report to you the results of my investigation into the cause(s) of the sling failure in the subject accident.

In the course of my investigation I examined or reviewed the following items:

1. The subject sling. I also photographed it, and a CD containing these photographs is attached to this report
2. The second amended complaint.
3. Copies of color photographs that you supplied to me.
4. A CD of photographs from the offices of E. Powers.
5. The depositions of: Revak, Bijerk, Lukassen, Strijland, Kuursta, Häggkvist, Eriksson, Mattsön, Johansson and Ogren.
6. The report of Robert A. Erb, Ph.D.

Mr. Revak was injured by a bundle of lumber that fell on him when an endless polyester lifting sling failed. You asked me to determine, if possible, why the sling failed.

According to the deposition testimony, the draft of lumber that fell on Mr. Revak consisted of 4 or 5 individual bundles, weighing approximately 1100 pounds each, for a total weight of 5500 pounds, assuming five bundles in the draft. Two endless lifting slings, each of which had a working load limit of 2000 kilograms (4400 pounds) supported this weight. (Chief Officer Lukassen said in his deposition that the slings have a safe working load of 3500 kilograms or 7700 pounds. I believe he was mistaken because the green color of the sling indicates it to have a 2000-kilogram working load limit. The label is missing from the sling, so the working load limit must be inferred from the color.) The two slings combined had a total capacity of 8800 pounds in a straight pull, compared to an actual weight in the draft of 5500 pounds, but the pull was not straight, so the working load limit must be commensurately reduced. Given the dimensions of the bundles and the length of the straps, the effect of this angle is to reduce the working load limit by only about 15%. Thus under these conditions, the safe working load of the two

RECEIVED DEC 1 1 2006

slings combined was 7480 pounds, compared to the actual weight in the draft of 5500 pounds (with five bundles of lumber). This calculation shows that the sling was not overloaded at the time of the accident.

When a damage-free sling is loaded to its working load limit it will definitely NOT fail, since the working load limit is much smaller than the breaking load of the sling. In fact, the working load limit is required by European Standard EN 1492-1 to be no more than one seventh of the breaking strength of the sling. Therefore the subject sling would be expected to break at a load of 7 times 7480 pounds, or 52,360 pounds. The fact that this breaking load is almost ten times larger than the load placed on it at the time of the accident indicates that the sling had been severely damaged prior to the accident. In the following I consider possible sources of that damage.

Except for the fracture in the subject sling and a deliberate cut made after the accident, the sling shows little damage. The surface of the sling is abraded in some areas, but only a very small fraction of the fibers is significantly damaged. Also, some fibers are cut in some localized areas, but, again, the number of cut fibers is a very small fraction of the total. Since the strength of the sling is determined by the fraction of undamaged fibers, the damage to the fibers outside the failure zone reduced the breaking strength of the sling by only a few percent. Samples of this damage are shown in Photographs #1 and 2.

I now consider the specific area of the fracture, as shown in Photograph 3. This photograph shows the two sides of the fracture placed end to end in their correct relative orientations. Most of the fracture surfaces consist of a relatively straight portion that is perpendicular to the axis of the sling. The length of this section is about 50 mm of the 60 mm width of the strap, indicated by 'pinched/cut' on the photograph. The second portion of the fracture surface consists of a 10 mm wide 'tail' attached to the right side with a matching area on the left side. In addition, the 50 mm long section on the left side underwent considerable lateral contraction, as shown in the photograph, while the right side underwent little or no contraction. The absence of lateral contraction on the right hand side indicates that this side was subjected to much smaller loads at failure than the left hand side. Furthermore, the left side of the fracture is abraded in the direction shown, and this abrasion terminates on a 'nub' of polypropylene fibers on the right side of the fracture. All these features point to the fact that the 50 mm long portion of the fracture resulted from the sling having been pinched between a fixed object and the load during lifting. Under such a condition, the left side of the fracture was placed under very high stress while the right side bore a much smaller load, resulting in both the pinching/cutting of the sling along the 50 mm length of the fracture and the lateral contraction on the left hand side. After the sling was cut, no more than a 10mm wide section of the sling was carrying the load, see '10 mm wide remaining ligament' on the photograph.

Based on the above observations of the fracture surface and the surrounding area, I conclude that the damage reduced the strength of the sling by at least 80%.

The two sides of the fracture in Photograph #3 show no other differences, for example, no differences in soiling, indicating that the damage to the sling occurred relatively

recently relative to the time of the accident. Damage of the type described here is not uncommon, for example, see pages 53 and 54 of Mr. Eriksson's deposition.

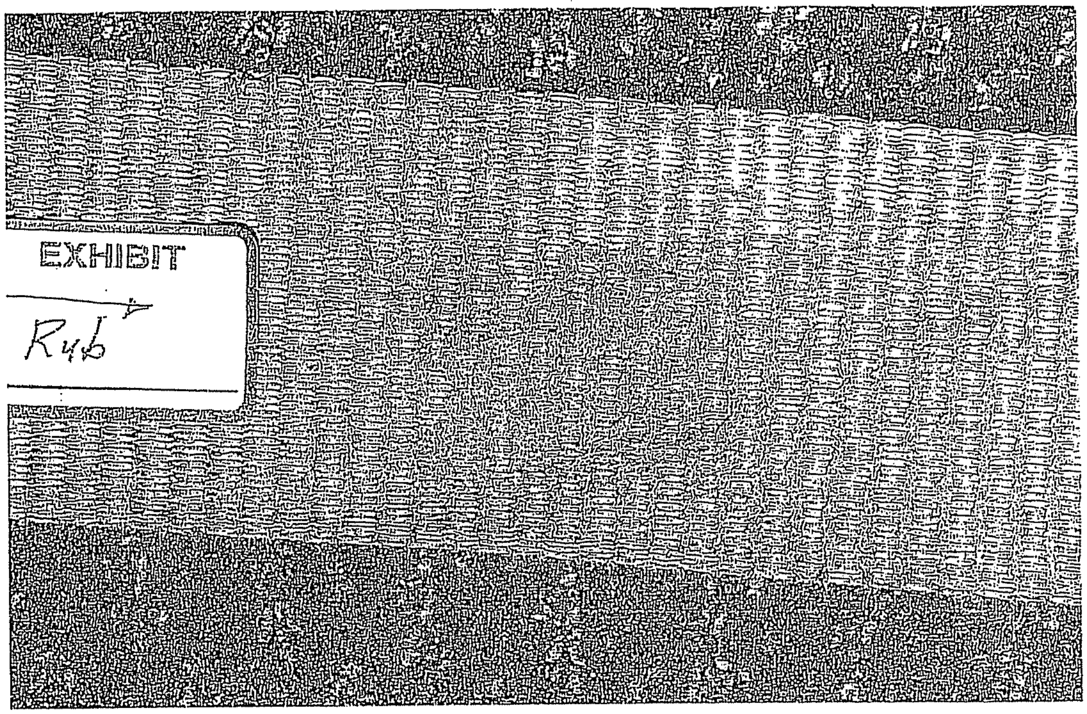
Given that the sling was so severely damaged prior to the accident, and that it failed while the load was just being slightly repositioned, it is highly unlikely that it could have withstood the forces required to lift the draft out of the ship. Therefore the damage occurred during the lift itself, i.e., the draft pinched the sling against a portion of the ship while it was being lifted from the ship in Philadelphia.

In summary, I conclude the following to a reasonable degree of engineering certainty: The subject sling was damaged and its load bearing capacity was reduced by at least 80% while the draft was being lifted from the ship in Philadelphia. The remaining segment of the damaged sling could just carry the dead load of the draft, but a small increase in the load, as caused by moving the load as it was being positioned above the dock, was sufficient to break that remaining small segment. There is no evidence that the sling was damaged to the point of being unsafe prior to the final lift in Philadelphia, rather, the damage leading to the failure was introduced during this final lift. It is also likely that the label was torn from the sling by this same event.

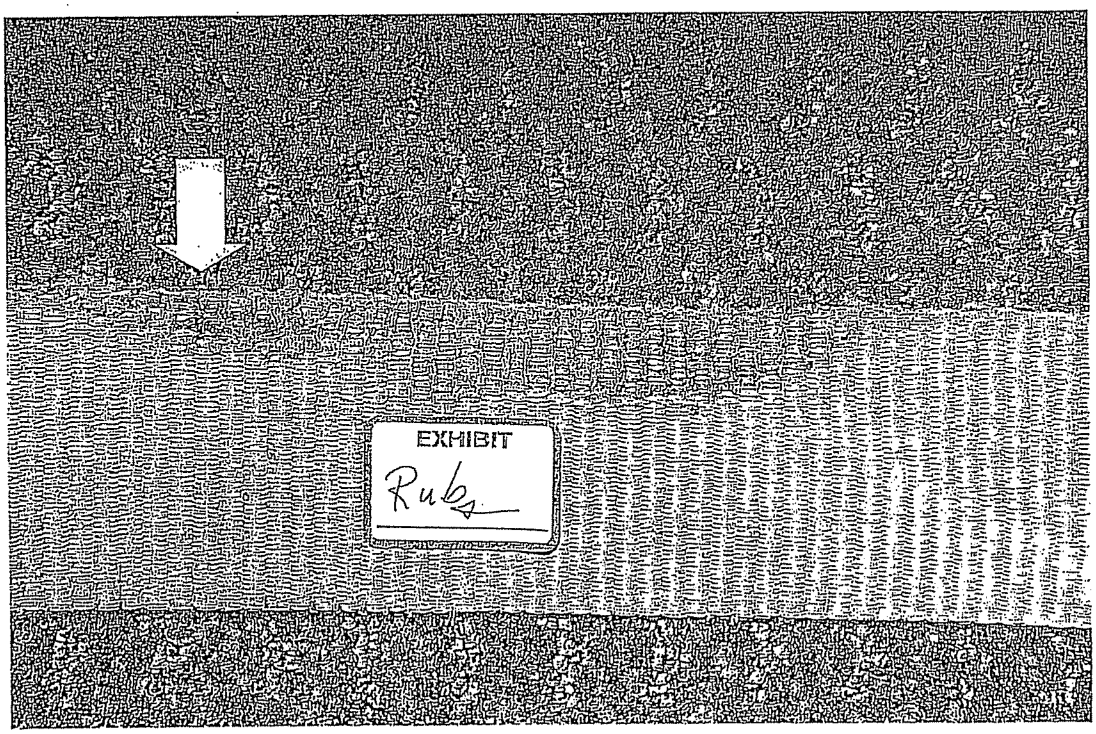
Sincerely,

David P. Pope

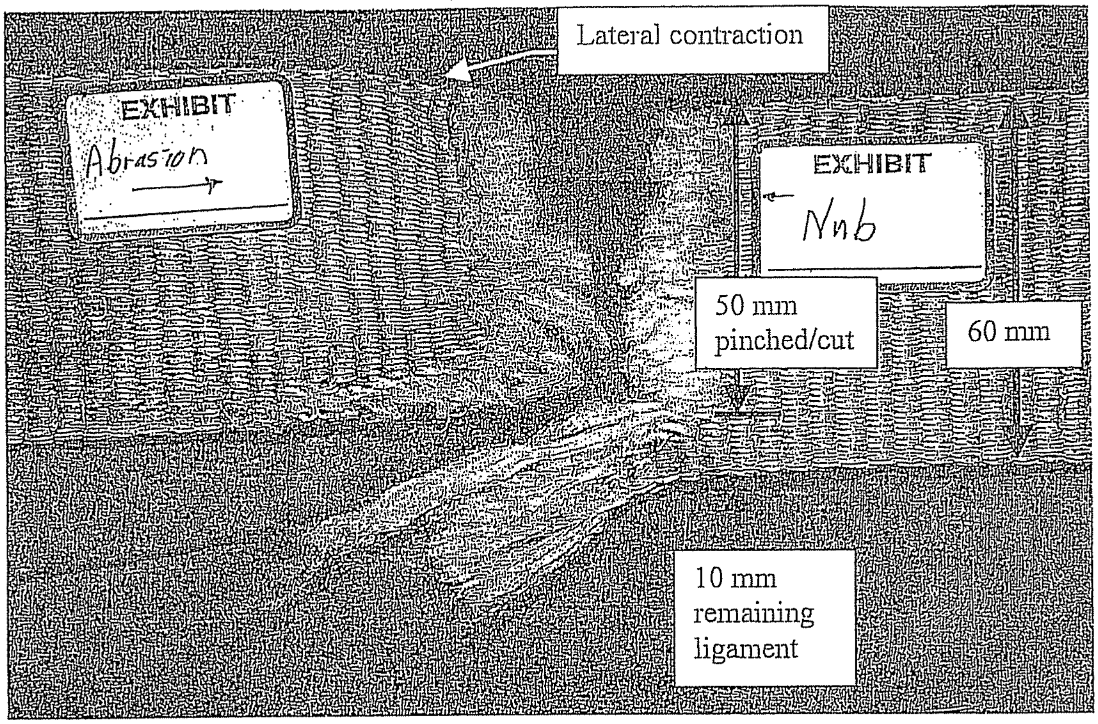
David P. Pope, Ph.D.



Photograph #1. An area of abrasive wear on the sling. Note the absence of cut fibers.



Photograph #2. An area of abrasive wear with some cut fibers, see arrow.



Photograph #3. The fracture site on the sling. Prior to the accident 50mm of the 60 mm cross section was cut, leaving only a 10 mm remaining ligament to carry the load.